What is claimed is:

1. A thrust sensing valve assembly, comprising:

a housing including an input port and an output port and further having a mounting portion adapted to be coupled to a manufacturing tool;

a supply member adapted to be coupled to a source of a pressurized medium and operatively coupled to the housing to provide a flow of the pressurized medium into the input port of the housing; and

an elongated body operatively coupled to the housing and moveable along an axis between a first position corresponding to a first pressure output from the housing and a second position corresponding to a second pressure output from the housing, the elongated body being biased into the first position, and being moveable into the second position in the presence of a thrust force on the mounting portion.

2. The assembly of Claim 1, wherein the elongated body includes at least one first keyway disposed therein and the housing includes at least one corresponding second keyway disposed therein, the elongated body being operatively coupled to the housing by at least one pin extending between the first and second keyways.

3. The assembly of Claim 2, wherein the at least one first and second keyways include a pair of concentrically-spaced keyways positioned on opposing sides of the elongated body.

4. The assembly of Claim 1, wherein the supply member includes a supply gland at least partially disposed about the housing.

5. The assembly of Claim 1, wherein the supply member includes a supply gland concentrically disposed about at least a portion of the housing.

6. The assembly of Claim 5, wherein the housing is adapted to rotate within the supply gland.

7. The assembly of Claim 5, wherein the housing is further adapted to translate along a longitudinal axis through the supply gland.



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8. The assembly of Claim 1, wherein the supply member includes a projection extending outwardly therefrom, the projection being adapted to be coupled to a source of a pressurized medium.

9. The assembly of Claim 1, further comprising a spring operatively disposed about a portion of the housing and biasing the elongated body into the first position.

10. A drill assembly, comprising:

a drive assembly operatively coupled to a drill member and adapted to rotate the drill member about a longitudinal axis, and to advance and retract the drill member along the longitudinal axis;

a thrust sensing valve assembly operatively coupled to the drive assembly and to the drill member, the thrust sensing valve assembly including:

a housing including an input port and an output port and further having a mounting portion operatively coupled to the drill member;

a supply member adapted to be coupled to a source of a pressurized medium and operatively coupled to the housing to provide a flow of the pressurized medium into the input port of the housing; and

an elongated body operatively coupled to the housing and moveable along an axis between a first position corresponding to a first pressure output from the housing and a second position corresponding to a second pressure output from the housing, the elongated body being biased into the first position, and being moveable into the second position in the presence of a thrust force on the mounting portion.

11. The drill assembly of Claim 10, further comprising a source of pressurized medium operatively coupled to the supply member.

12. The drill assembly of Claim 10, wherein the drive assembly includes a control valve operatively coupled to the thrust sensing valve and being adapted to advance the drill member upon an initial occurrence of the first pressure output, and to continue to advance the drill member upon an occurrence of the second pressure output, and to retract the drill member upon a second occurrence of the first pressure output.

13. The drill assembly of Claim 12, wherein the control valve includes a 4-way pneumatic control valve.



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14. The drill assembly of Claim 10, wherein the elongated body includes at least one first keyway disposed therein and the housing includes at least one corresponding second keyway disposed therein, the elongated body being operatively coupled to the housing by at least one pin extending between the first and second keyways.

15. The drill assembly of Claim 14, wherein the at least one first and second keyways include a pair of concentrically-spaced keyways positioned on opposing sides of the elongated body.

16. The drill assembly of Claim 10, wherein the supply member includes a supply gland at least partially disposed about the housing.

17. The drill assembly of Claim 10, wherein the supply member includes a supply gland concentrically disposed about at least a portion of the housing.

18. The drill assembly of Claim 17, wherein the housing is adapted to rotate within the supply gland.

19. The drill assembly of Claim 17, wherein the housing has a longitudinal axis and is adapted to rotate about the longitudinal axis and translate along the longitudinal axis within the supply gland.

20. The drill assembly of Claim 10, wherein the supply member includes a projection extending outwardly therefrom, the projection being adapted to be coupled to a source of a pressurized medium.

21. The drill assembly of Claim 10, wherein the drive assembly includes:

a drive motor having retract exhaust port and a drill exhaust port; and

a control valve assembly operatively coupled to the drive motor and to the thrust sensing valve assembly,

wherein the control valve assembly is adapted to operate in a first operating condition when the thrust sensing valve assembly is in a closed position to route a drive medium through the retract exhaust port of the drive motor to retract the drill member along the longitudinal axis away from a workpiece,



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the control valve assembly being further adapted to operate in a second operating condition when the thrust sensing valve assembly is in the closed position to route the drive medium through a drill exhaust port of the drive motor to advance the drill member along the longitudinal axis toward the workpiece,

the control valve assembly being further adapted to operate in a third operating condition when the thrust sensing valve assembly is in an open position to route the drive medium through both the drill exhaust port and the retract exhaust port of the drive motor to continue to advance the drill member along the longitudinal axis toward the workpiece, and

the control valve assembly being further adapted to operate in a fourth operating condition when the thrust sensing valve assembly has returned to the closed position to route the drive medium through the retract exhaust port of the drill motor to retract the drill member along the longitudinal axis away from the workpiece.

22. A method of performing a manufacturing operation on a workpiece, comprising:

while advancing a manufacturing tool toward the workpiece, sensing a first thrust condition exerted upon the manufacturing tool;

while advancing the manufacturing tool into engagement with the workpiece, sensing a second thrust condition exerted upon the manufacturing tool;

while advancing the manufacturing tool into engagement with the workpiece, sensing a return from the second thrust condition at least partially to the first thrust condition; and

retracting the manufacturing tool away from the workpiece.

23. The method of Claim 22, wherein sensing a first thrust condition exerted upon the manufacturing tool includes sensing a first thrust condition using a thrust valve assembly.

24. The method of Claim 22, wherein sensing a first thrust condition exerted upon the manufacturing tool includes sensing a zero thrust condition exerted upon the manufacturing tool.

25. The method of Claim 22, wherein sensing a second thrust condition exerted upon the manufacturing tool includes sensing a non-zero thrust condition exerted upon the manufacturing tool.



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26. The method of Claim 22, wherein while advancing a manufacturing tool toward the workpiece includes while simultaneously rotating and advancing a manufacturing tool toward the workpiece.

27. The method of Claim 22, wherein sensing a return from the second thrust condition at least partially to the first thrust condition includes sensing a breakthrough of the manufacturing tool through the workpiece.

28. The method of Claim 22, wherein retracting the manufacturing tool includes simultaneously rotating and retracting the manufacturing tool.

29. A method of performing a drilling operation on a workpiece, comprising:

providing a thrust sensing valve operatively coupled to a drill member;

while advancing the drill member toward the workpiece, sensing a first thrust condition using the thrust sensing valve;

while continuing to advance the drill member into engagement with the workpiece, sensing a second thrust condition using the thrust sensing valve;

while advancing the drill member into engagement with the workpiece, sensing a return from the second thrust condition at least partially to the first thrust condition; and

retracting the drill member away from the workpiece.

30. The method of Claim 29, wherein sensing a first thrust condition using the thrust sensing valve includes sensing a first thrust condition exerted upon the manufacturing tool.

31. The method of Claim 29, wherein sensing a first thrust condition using the thrust sensing valve includes sensing a zero thrust condition.

32. The method of Claim 29, wherein sensing a second thrust condition using the thrust sensing valve includes sensing a non-zero thrust condition.

33. The method of Claim 29, wherein while advancing a drill member toward the workpiece includes while simultaneously rotating and advancing a drill member toward the workpiece.



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34. The method of Claim 29, wherein sensing a return from the second thrust condition at least partially to the first thrust condition includes sensing a breakthrough of the drill member through the workpiece.

35. The method of Claim 29, wherein retracting the drill member includes simultaneously rotating and retracting the drill member.

36. The method of Claim 29, wherein providing a thrust sensing valve operatively coupled to a drill member includes providing a thrust sensing valve operatively coupled to a control valve assembly of a drive motor, the drive motor being adapted to advance and retract the drill member.

37. The method of Claim 36, wherein while advancing the drill member toward the workpiece, sensing a first thrust condition using the thrust sensing valve includes operating the control valve assembly in a first operating condition when the thrust sensing valve is in a closed position to route a drive medium through an advance exhaust port of the drive motor to advance the drill member toward the workpiece.

38. The method of Claim 37, wherein while continuing to advance the drill member into engagement with the workpiece, sensing a second thrust condition using the thrust sensing valve includes operating the control valve assembly in a second operating condition when the thrust sensing valve is in an open position to route the drive medium through both the advance exhaust port and a retract exhaust port of the drive motor to continue to advance the drill member toward the workpiece.

39. The method of Claim 38, wherein while advancing the drill member into engagement with the workpiece, sensing a return from the second thrust condition at least partially to the first thrust condition includes operating the control valve assembly in a third operating condition when the thrust sensing valve has returned to the closed position to route the drive medium through the retract exhaust port of the drill motor to retract the drill member away from the workpiece.



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